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RENEWABLE ENERGY AND CONSERVATION PROGRAM

Department of Natural Resources and Conservation
Larry Fasbender, Director
December 1986

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50th Montana Legislature

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RENEWABLE ENERGY AND CONSERVATION PROGRAM

In response to the state's revenue shortfall, the Department of Natural Resources and Conservation made two major changes in the renewable Energy and Conservation Program (RECP) in the past two fiscal years.

First, DNRC agreed to transfer $3.35 million from the RECP fund to other state programs. Through careful management, strict project selection criteria, and a commitment to spend only what was warranted and not all that was appropriated, DNRC had accumulated a sizeable RECP fund balance at the end of FY 1985. This allowed the 1985 Legislature to use $2 million in RECP funds to start the Science and Technology Program. The 1986 Special Session approved DNRC's request to transfer another $1.35 million from the RECP fund to the general fund to help offset the revenue shortfall.

Second, DNRC redirected the program to emphasize energy conservation measures for state-owned buildings. The 1985 Legislature authorized DNRC to fund energy conservation measures on state buildings under RECP to help reduce the operating costs of state government. The energy conservation measures for the four buildings funded in FY 86 are expected to save the state $64,000 per year in electricity and natural gas costs. The savings will continue throughout the buildings' lives. Over the past two years, fewer grants and loans for renewable energy projects have been awarded. In FY 86 grants for the development of renewable energy resources and loans for commercialization of renewable energy resources were focused on agriculture and timber resources. The grants and loans program was suspended for FY 87.

Several factors besides state government's revenue shortfall supported these changes in RECP.

1. The legislature's original goal in setting up the program was to reduce the state's reliance on fossil fuels.

2. General economic conditions in the state.

3. The surplus of electricity in Montana and throughout the Pacific Northwest. The Northwest Power Planning Council predicts the surplus will last into the 1990s.

4. Waning interest in renewable energy because of low energy prices and the relatively high cost of generating most types of renewable energy.

5. The expiration of federal renewable energy tax credits in 1985.

Also, energy conservation retrofits of institutional buildings are proven energy and money savers in Montana. The Institutional Conservation Program, which DNRC administers for the U.S. Department of Energy, invested $11 million in conservation for Montana institutions between 1978 and 1985. Those investments save Montana institutions $4.5 million in energy costs each year.

STATE BUILDINGS ENERGY CONSERVATION

State agencies spend over $13 million each year for electricity and natural gas to heat, cool, and operate buildings. RECP helps reduce those costs by funding energy conservation measures on state-owned buildings. The state owns 1,000 buildings larger than 4,500 square feet and hundreds of smaller buildings. Energy conservation investments on four state buildings in FY 86 are expected to save the state $64,000 per year on energy bills.

FY 86 PROJECTS

During FY 86 DNRC considered eight buildings that already had undergone energy analysis. Retrofits were done on the buildings where the energy and dollar savings were the greatest.

Retrofits were funded for the Department of Highways Complex in Billings and for three Montana State University buildings in FY 86. The four retrofits used $287,528 in coal severance tax funds, $89,368 in federal funds and $40,759 from the agencies that own the buildings or from the Department of Administration's Architecture and Engineering Division.

Although each retrofit saves a different amount of energy, the four retrofits will pay for themselves in energy savings in six and a half years, yielding a 15 percent return on investment. Each project's payback period is less than eight years. The Romney Gym project at MSU, for example, should pay for itself in less than four years. After the retrofits pay for themselves, they will continue to generate savings for the state throughout the useful life of the buildings. (The savings figures used in this report are based on current energy prices.)

See Appendix A for a more detailed description of the work done on the four buildings.

FY 87 PROJECTS

All state agencies were invited to submit applications for energy analyses of their buildings by October 1, 1986. DNRC received applications for 220 buildings. Six buildings were selected immediately for analysis because of their extremely high energy use. DNRC engineers are reviewing the remaining 214 buildings. They will select an additional ten to fifteen buildings with the highest potential for energy and dollar savings based on the type of building, square footage, type of fuel used, and amount of fuel consumed.

In-depth studies of these buildings will be done to identify the most cost-effective energy conservation measures for each building. Each analysis describes the building's structural components and energy systems and identifies ways energy can be saved. The analysis lists the cost of various energy conservation measures and estimates how much energy and money each measure will save on annual energy bills for that specific building. DNRC staff engineers will do the audits on the smaller and less complex buildings, but Montana engineers and architects, selected through a formal request for proposals process, will conduct the analyses on the more complex buildings. After the studies are finished in early 1987, DNRC will work with the Department of Administration's Architecture and Engineering Division to select several buildings for retrofits. The primary selection criteria will be the amount of energy and money to be saved. Several energy conservation measures will be installed on each building. The combined payback of all measures will be used to determine savings. The Department of Administration will oversee the project design, bidding, and installation of the energy conservation measures in accordance with state construction laws and purchasing procedures. Construction should start in the spring.

A total of $390,972 is budgeted in FY 87 for energy conservation retrofits. Another $60,000 is budgeted for energy analysis of state buildings by consulting engineers and architects.

RECP also trains building operators in energy-saving techniques they can use in operating and maintaining state buildings. Training occurs informally as engineers and auditors work with building operators to conduct energy analyses and report the results of the analyses to the agencies. Training on specific topics, such as boiler efficiency modifications, is done more formally at workshops. Generally a significant portion of energy savings comes from operational and maintenance changes. For example, Rossiter School in Helena saved $2,838 a year by repairing the night setback control on the thermostat in the school library. The repairs cost $100. While relatively few buildings will receive energy retrofits each year, many buildings will be able to reduce energy costs by implementing practices learned in these formal and informal training sessions.

REPAYMENT

The 1985 legislation allowed participating agencies to either repay the RECP grants or provide matching funds. MSU and the Department of Highways provided matching funds for the four projects funded in FY 86. During the 1986 Special Session, the legislature voted to require participating agencies to repay RECP for the grants or to reduce their budgets commensurate with documented energy savings. DNRC will review the energy use and determine energy savings for agencies receiving retrofits in FY 87 or later. These savings will be used to establish a repayment schedule or be provided to the Office of Budget and Program Planning for budget reductions. Reports on savings due to FY 87 grants will be turned in to the Office of Budget and Program Planning prior to the 1989 legislative session.

GRANTS

Grants were awarded to stimulate research, development, demonstration, and education on energy conservation techniques and renewable energy sources, including solar, wind, geothermal, small-scale hydro, and biomass.

Six organizations received grants in FY 86. All of the projects were related to the agriculture or timber industries. The grants ranged from $5,025 for a study of ways to enhance manufacturing and marketing of wood pellets for heating to $120,212 to develop a reactor that would produce liquid fuel from wood. Other projects include: a process that makes the cellulose in straw and wood easier to use in making paper or ethanol; using vegetable oil as a substitute for diesel fuel; and seeing how much energy superinsulated homes save. See Appendix B for more complete descriptions of the FY 86 projects. See Appendix C for descriptions of some of the projects done in previous years.

Although DNRC didn't solicit grant proposals in FY 87, one grant had been awarded as of Dec. 1, 1986. A $16,121 grant was awarded to extend wind monitoring at three sites on the Livingston Bench. The project is a unique opportunity to gather data that will be invaluable to businesses considering Livingston locations for wind generators. Because the monitoring equipment is already in place, the cost of gathering the data now is significantly lower than it will be in the future. Data collected so far has been exceptionally reliable.

LOANS

Loans are offered for commercialization of renewable energy technologies. Twenty-one loans have been funded since they were added to the program in 1983. Four loans already have been paid back in full.

The loans are awarded to commercial businesses through private financial institutions. DNRC reviews loan applications to ensure that the projects are technically feasible. The lending institution reviews the application the way it would any request for a commercial loan and is responsible for servicing the loan. If the lending institution approves, DNRC provides up to 90 percent of the loan principal at the current Federal Reserve discount rate. The private lending institution loans the remaining principal at a rate not exceeding its customary interest rate considering the size of the proposal and risk associated with it. The loans must be repaid within ten years of the date they're issued.

Only two loan applications were received in FY 86. One loan was approved--$174,982.50 to the Harrington Company to expand the capacity of its combination feed lot and ethanol plant in Dillon. The by-products of the ethanol plant are used as food for the cattle in the feed lot. Operating since May 1985, the plant is now producing almost at its designed capacity. DNRC provided 77 percent of the loan and a bank covered the remaining 23 percent. The DNRC portion of the loan was at 6 percent interest, and the bank's portion was at 10 percent, giving Harrington a blended interest rate of 6.8 percent. The initial DNRC loan of $299,700, which helped build the plant, is being repaid on schedule.

DNRC is not soliciting loan applications in FY 87.

Appendix C lists some of the projects carried out with loans in previous years.

RENEWABLE ENERGY TECHNOLOGY

DNRC staff members are reviewing the current status of renewable energy technologies. A report on the status of the technologies will be available in early 1987.

ECONOMIC BENEFITS

In addition to reducing the state's energy bills, the retrofits on state buildings also generate work for the state's energy consultants and construction companies.

The grants and loans also provide economic benefits to the state.

"We probably wouldn't be here today if it weren't for all that work from DNRC in the beginning," said Ken Runnion of Renewable Technologies Inc. of Butte. RTI started out five years ago. "Two years ago we had four people, and DNRC work supported 75 percent of our company. That work we did for DNRC enabled us to get other work; we've grown and expanded by using the same system we developed under the DNRC grant for different organisms and different products. Now the DNRC grant amounts to about 10 percent of our income."

The firm now employs fifteen people. It has received $500,000 in grants from the U.S. Department of Energy, $50,000 in grants from the U.S. Department of Agriculture, and several smaller grants from private organizations. Several large firms have expressed serious interest in RTI's ambient temperature starch hydrolysis enzyme.

"In terms of bringing money into the community from out of state, we have brought in three times the amount of our DNRC grants," Runnion said. "That's a three-to-one return on your investment."

Ron Johnson, who used an RECP loan to expand his combination feed lot and ethanol plant in Dillon, said his operation puts "about $4.2 to $4.3 million a year in value added into the economy of southwestern Montana; that's all the grain we use, the cattle we've increased the value of, the alcohol we sell, the trucking services we use to haul everything in and out, and the wages the men earn. Seven men work in the ethanol plant and another seven work at the feed lot.

"The alcohol plant has given southwestern Montana farmers and ranchers a ready market for damaged grain, high moisture grain, and grain that they could not sell profitably any place else. We have maintained a consistent market for the soft white wheat in our area, and actually have probably been the major contributor to a profitable white wheat market in the southwestern corner of Montana."

The plant uses about 600 bushels of grain a day Johnson said, adding that about 20 percent of that is damaged grain.

Another loan recipient, the Bitterroot Timber Pellet Plant in Darby, now employs seven people.

"We're selling everything we make," said Gary Schulz, owner of the plant. "In the last three months we've sold 1,000 tons of wood pellets mostly to Washington and Idaho without any advertising; all this business has come simply by word of mouth."

Schulz is planning to triple the size of his plant next spring to keep up with the demand for the clean burning wood pellets for stoves.

Another loan recipient, Garden City Energy in Missoula, now employs five people full time and four people part time.

By selling wood pellets, which are cleaner burning than cord wood, said Harlene Fortune, co-owner of the business, the store helps people save money on their heating bills while improving the air quality.

In some cases the economic benefits of grants are long-term and difficult to quantify. For example, research done under an RECP grant at the Eastern Agricultural Research Center in Sidney developed a variety of safflower that is especially good for use as diesel fuel. While working on the diesel fuel project, the researchers also made some breakthroughs in safflower varieties for food purposes. Both the variety for diesel fuel and the ones for food are new and better crops for Montana farmers. The work done under the RECP grant also helped the center attract additional research funds.

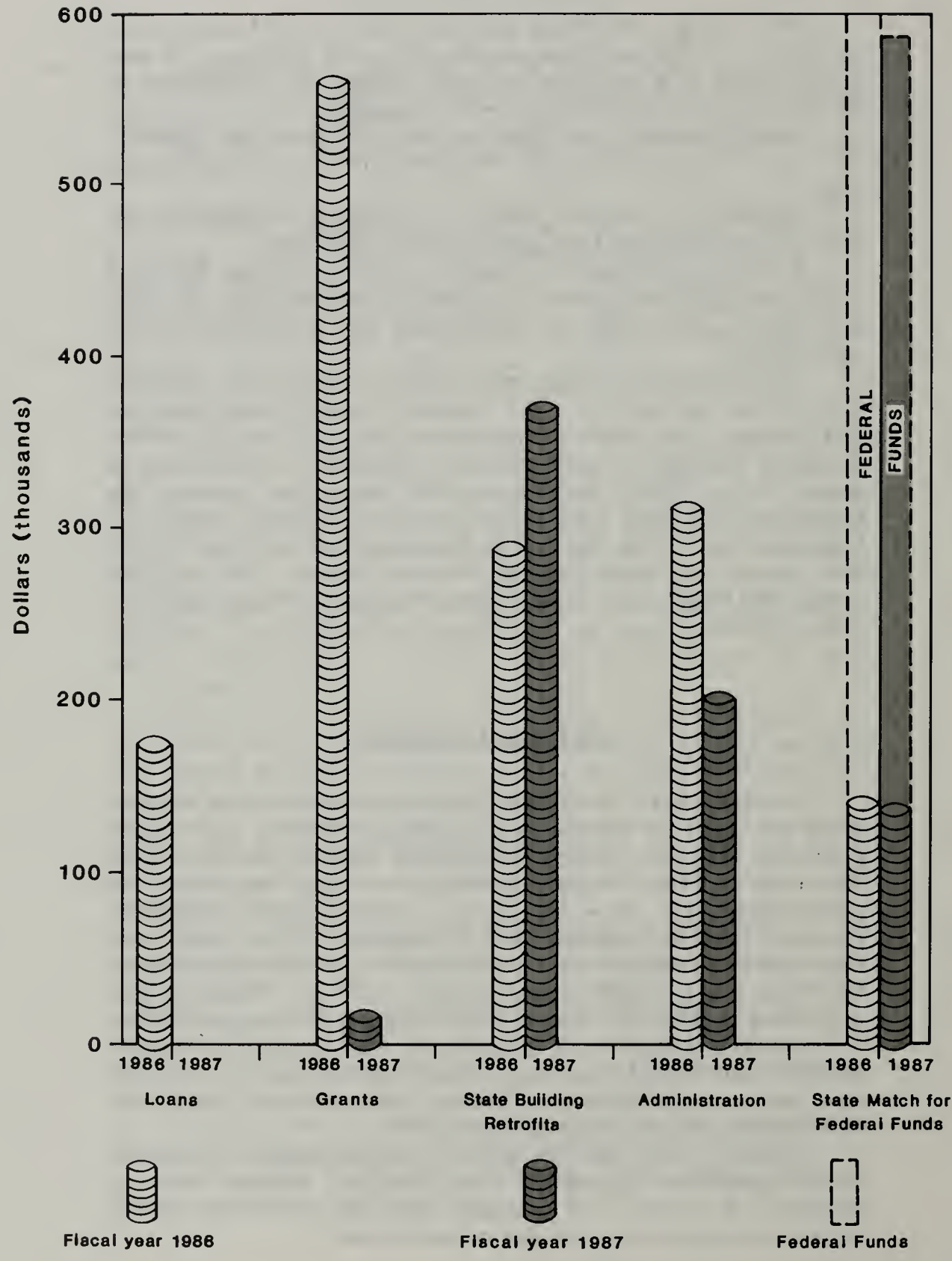
FEDERAL FUNDS

A portion of the Renewable Energy and Conservation Program funds are used as the required matching funds for four federal programs. The State Energy Conservation Program and the Energy Extension Service provide accurate, relevant information on conservation and renewable energy resources and technologies, primarily through workshops and publications. DNRC is providing these services throughout the state with $71,117 of coal severance tax funds and $355,586 of federal funds in FY 87. These services are similar to those that used to be provided directly through RECP.

Between $30,000 and $40,000 are used annually to match administrative costs for the Institutional Conservation Program. ICP uses approximately $300,000 of federal funds each year for retrofits of schools and hospitals throughout the state.

Matching funds are also provided for the Biomass Utilization and Cogeneration program. This program provides technical assistance to persons and businesses who use or wish to develop biomass resources, such as timber or wood waste.

1986 EXPENDITURES AND 1987 BUDGET



APPENDIX A

STATE BUILDINGS RETROFITS FUNDED IN FY 86

ROMNEY GYM AT MSU

Based on an extensive study of Romney Gym, an engineering firm recommended installing pipe insulation, a pool cover, wall insulation, and more efficient lights. Thermostatic controls are being installed to automatically turn down the room and pool temperatures at night when the building isn't being used. The total cost of the project is $66,430. The federal Institutional Conservation Program will pay $12,350, MSU will pay $12,350, and RECP will pay $41,730. The measures are expected to save the state $16,960 a year on natural gas and electric bills.

LEWIS HALL AT MSU

Thermostatic control valves, pipe insulation, steam controls, a night temperature setback, wall insulation, and insulation for the hot water pipes are being installed on Lewis Hall at MSU. Exit and corridor lights will be replaced with more efficient models. The measures will cost $49,600 and should pay for themselves in approximately seven years. RECP will pay $38,700 of the measures, federal funds will cover $5,450, and MSU will pay the remaining $5,450.

GAINES HALL AT MSU

Conservation measures on Gaines Hall included: installing an automatic control on the snow-melt system; heat recovery for exhaust fans; weatherstripping; and adding more wall insulation. The retrofit cost a total of $185,535; RECP provided $112,103; the Institutional Conservation Program covered $71,568; and MSU paid $1,864. The retrofit should pay for itself in approximately eight years.

DEPARTMENT OF HIGHWAYS BILLINGS DIVISION HEADQUARTERS COMPLEX

Measures at the Department of Highways Billings Division Headquarters included: installing thermostats that automatically lower the room temperature at night and on weekends when the building isn't in use; modifications to the heating, ventilating, and air-conditioning system; weatherstripping; caulking; and adding storm windows and wall insulation. Overhead doors were replaced with more efficient models, insulation was added to road oil tank heaters, and one-hour timers were installed on the lights in the storage areas. Taping sheet rock, dropping a ceiling, and installing metering equipment to track the energy use also will be done.

The retrofit cost $116,090. RECP covered $94,995 of the costs. The Highway Department covered the rest of the costs. The retrofit is expected to save $16,168 per year in energy costs and should pay for itself in about seven years.

APPENDIX B

FY 86 GRANTS

1. Renewable Technologies Inc. (RTI) of Butte received a $69,962 grant to continue to develop a process that makes the cellulose in straw and wood more accessible for use in producing sugars for alcohol fermentation or in making paper. If RTI makes a profit from the project, it will repay its DNRC grants. RTI also received a $46,000 grant from the U.S. Department of Energy Small Business Innovative Research Program for the project.

2. Montana State University received two grants for research on the use of vegetable oil as a diesel fuel. Currently vegetable oil cannot be used to replace diesel fuel in engines because the vegetable oil reacts with lubricating oils, clogging and damaging the engine. A $54,166 grant project focuses on improving vegetable oil itself, while a $40,205 grant project studies using lubrication oil additives to prevent plant oils from clotting in diesel crankcases. The projects are concentrating on safflower oil because safflower grows so well in Montana.

3. The Bitterroot Resource Conservation and Development Council received a $5,025 grant to study ways to enhance manufacturing and marketing of wood pellets as heating fuel in Ravalli, Missoula, and Mineral counties. The study also received a $16,201 grant from the federally-funded Biomass Utilization and Cogeneration Program (BUC).

4. A.C. Lewis of Libby received a $120,212 grant to develop plans for a Hyacles process reactor for commercial use. The reactor would produce a liquid fuel from wood. This project also received a $34,508 grant from the BUC Program. If the project makes a profit, A.C. Lewis will repay the DNRC grant.

5. The National Center for Appropriate Technology in Butte received an $87,500 grant to see how much energy five superinsulated homes save and to see if there are any indoor air pollution problems in the homes. Three of the homes are in Great Falls, one is in Lewistown, and one is in Billings. This project also received a $20,000 grant from the Northwest Power Planning Council.

6. Glacier Log Homes of Whitefish received a $117,100 grant to demonstrate both the technical applicability and economic viability of a sawdust-fired wood furnace to heat a dry kiln. The kiln dries logs for building log homes. While this project was approved prior to FY 86, the actual grant award was made in FY 86.

APPENDIX C

PREVIOUS YEARS' PROJECTS

A few of the grants and loans from previous years are listed below to show the types of projects funded through the program. Final reports on many of these projects are available to Montanans from DNRC or from the Montana State Library through the Interlibrary Loan Program.

1. Garden City Energy Project used a $108,000 loan to build a wood pellet warehouse as an addition to their retail wood stove store in Missoula. The warehouse is set up like a grain elevator so customers can pull a pickup truck up into the elevator, weigh out the amount of pellets they need, and drop them into the pickup. The firm also bought a truck to deliver bags of the pellets weighing 50 to 1,000 pounds. The pellets are burned in special stoves and are so clean burning that pellet stoves can be used on air quality alert days in Missoula.

2. The South Dry Creek hydroelectric plant near Red Lodge sells an estimated $2,500 worth of electricity per day to Montana Power Company during the summer. Financing for the $1.4 million project included a $265,000 DNRC loan. Located on an irrigation ditch, the plant generates 1.9 to 2 megawatts of electricity and operates from April 1 through November 1.

3. The Bitterroot Timber Pellet Plant in Darby put additions onto its storage and handling facilities with a $99,000 loan. The additions were needed because of the plant's increased production. A dryer was also installed at the plant. Pellets are made from shavings obtained as waste from nearby log-house plants. Because the pellets don't contain bark, they are cleaner burning in residential stoves than most other pellets.

4. Renewable Technologies Inc. (RTI) of Butte developed a process that uses an enzyme to convert barley to alcohol without using heat. A commercial demonstration of the process in Dillon in March 1986 brought the firm an inquiry from Archer Daniel Midland Inc. ADM produces 1.3 million gallons of ethanol a day in plants throughout the Midwest. ADM expressed interest in financing construction of an enzyme production facility. RTI is currently designing an enzyme production facility. If RTI makes a profit from the project, it will repay its DNRC grants. This project received two repayable grants from DNRC totaling $418,473; RTI also received $550,000 in federal funding.

5. RTI was selected through a request for proposals process to produce the Montana Biomass Permitting Handbook. RECP paid $13,723 for the project. The federally-funded Biomass Utilization and Cogeneration Program covered the remainder of the $25,000 project. The handbook is designed to help developers of commercial-size biomass projects. It is especially helpful to people planning to develop a densification plant, set up an ethanol fuel plant, or burn waste wood at a lumber mill.

6. The Steep Slope Thinning and Residue Recovery Project researched and demonstrated techniques that allow lumber companies to harvest timber that previously went to waste because it was too difficult to harvest. Nearly 200 copies of the project's final report have been distributed. About 600 people have attended demonstrations of the techniques since September 1983. DNRC provided $20,262 from RECP, $20,700 from the Renewable Resource Development Program, and $35,000 from the Biomass Utilization and Cogeneration Program for this research and demonstration project. The U.S.D.A. Forest Service provided an additional $4,151, Champion International provided $3,456, and Potter's Logging provided $1,650.

7. Three wind monitoring projects will provide data on wind energy. By clearly identifying the amount of wind energy available, the data will help promote development of Montana's wind energy.

a. A 45-meter tower on the Livingston Bench measures wind shear and turbulence at 10 meters, 30 meters, and 45 meters above the ground. Multitech of Butte is doing the project under a $119,163 grant. The project will give developers information on the forces wind machines face on the Livingston Bench.

b. GeoResearch used a $36,523 grant to put up three fifty-foot towers on the Livingston Bench. The three monitoring stations will provide an assessment of the overall wind regime on the bench. The data so far indicate that other bench sites may have even more wind energy than the Livingston Wind Farm site. This grant was extended in FY 87 to collect an additional year's data to better determine the average annual wind speeds.

c. InterMountain Ambient is monitoring the wind at four sites around the state--Norris Hill near Ennis, north of Augusta, in the Shields Valley near Ringling, and near Whitehall. Multitech is also monitoring the wind at a site east of Anaconda. The monitoring at these five sites is being done in coordination with the Bureau of Reclamation's Northern Great Plains Wind Energy Survey Program.

MONTANA DEPARTMENT OF NATURAL RESOURCES & CONSERVATION

1520 EAST SIXTH AVENUE
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